An Analysis of Retail Self-Checkout Systems for the Defense Commissary Agency

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Logistics Management Institute

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Executive Summary

The Defense Commissary Agency (DeCA) tasked LMI to perform an independent analysis of the self-checkout systems available in the marketplace and recommend whether DeCA should consider installing them. Based upon our analysis, we believe that existing supermarket self-checkout technology is too expensive and carries too much risk for DeCA at the present time. Therefore, we recommend that DeCA adopt a "wait-and-see" position on self-checkout systems.

Before formulating our recommendation, we conducted a market survey to identify the self-checkout systems currently available, performed a financial analysis focusing on the costs and benefits of self-checkout systems and on their payback periods, analyzed the sensitivity of the payback periods to changes in labor rates and hardware acquisition costs, and assessed the risks associated with implementing self-checkout systems in commissaries.

MARKET SURVEY

The market survey showed that three self-checkout systems are available today:

- Productivity Solutions, Inc.'s full-service checklane—*Automated Checkout Machine (ACM)*

- Optimal Robotics/Spectra Physics PSC's express checklane—*U-Scan Express*

- Symbol Technologies Inc.'s portable self-scanning system—*Personal Shopping System*.

We also identified two emerging competitors:

- Store Automated Solutions, Inc.'s express checklane—*SASI eXPRESS*

- NCR's express checklane—*SCOT*.

The supermarket industry, particularly in the United States, has been slow to accept self-checkout technology. Only 23 stores in the U.S. have installed self-checkout systems, and most of those are test or pilot systems. Based on this information, we believe that any supermarket that implements self-checkout systems at this time will be breaking new ground.

FINANCIAL ANALYSIS

We also compared the life-cycle costs and benefits of a conventional ten lane commissary (using DeCA's new point of sale (POS) equipment) with those of three identical commissaries, each configured with one of the self-checkout systems.[1] In those comparisons, we used payback period as the key metric. Payback period is the time required for a self-checkout system's accrued financial benefits to equal its investment costs. Based upon our interviews with supermarket executives, we believe a payback period of around two years is required to make the decision to invest in a self-checkout system attractive.

We found that the self-checkout systems are very expensive, with life-cycle costs ranging from 80 to 110 percent higher than those for a new, conventional POS system. However, self-checkout systems are touted as offering two types of benefits that could offset those costs—lower labor costs and greater sales. Self-checkout vendors claim that their systems will reduce the number of cashier hours required to operate a grocery store, so labor costs are lower. They also claim that their systems will foster increased customer loyalty and attract new customers, resulting in higher sales. For DeCA, increased sales would result in increased surcharge. We believe that reduced labor costs are more important to DeCA because they directly affect appropriated funding requirements.

The self-checkout vendors submitted both cost data and assumptions to use in calculating DeCA's potential labor and surcharge benefits. The costs were full retail prices, which we did not discount. We also accepted the vendors' assumptions for calculating benefits, although we believe they are too optimistic for commissaries. For each of the three self-checkout systems, we then calculated two payback periods—one using only the labor savings and another using the total (labor savings and increased surcharge) benefit. Table 1 summarizes our results.

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[1] We also conducted financial analysis using two other commissary configurations—a five lane commissary configured entirely with self-checkout lanes, and a 21 lane commissary with two conventional lanes replaced by one express self-checkout system. The results of our analysis (detailed in Appendix A) were similar for all three configurations.

Table 1. Self-Checkout Payback Period

Self-checkout system	Labor payback period (in years)	Total payback period (in years)
PS Inc.	6.25	6.25
U-Scan	8.00	6.00
Symbol	15.00	6.00

As Table 1 shows, none of the three self-checkout systems has a payback period of less than six years, which is significantly higher than the two year payback preferred by supermarket executives.

SENSITIVITY ANALYSIS

In examining the sensitivity of the system's payback periods to changes in labor rates or hardware acquisition costs, we found that payback periods are relatively insensitive to increases in labor rates. After increasing labor rates by four percent annually, the payback period for all three systems decreased by one year or less. In contrast, system payback was more sensitive to reductions in hardware cost. Under a two or three year competitive acquisition cycle, if DeCA receives a fifty percent discount on self-checkout hardware, which may be possible, the payback periods shorten to 5.5 years, 3.25 years, and 3.5 years for PS Inc., U-Scan, and Symbol, respectively. Although those periods are still relatively long, a fifty percent reduction in hardware costs increases the economic viability of a self-checkout system.

RISK ANALYSIS

In performing the financial analysis, we made several key assumptions, all of which have associated risks. First, we assumed the self-checkout systems are technically acceptable and can be easily integrated into store operations. We believe that these technical and integration assumptions carry moderate to high risk. For instance, the systems cannot prevent customers from leaving the store without paying for their orders. In addition, cashiers must intervene in transactions when customers have difficulty identifying produce or other items without barcodes; want to purchase restricted items, such as tobacco products; or pay with food stamps or Women, Infants, and Children (WIC) vouchers. These problems increase the risk that DeCA may not achieve the estimated labor savings benefits.

Second, we assumed that the commissaries would not require major facility modifications to accommodate the self-checkout systems. Based upon DeCA's experience with the POS Modernization Program, this assumption carries high risk. The

checkout area in many commissaries is crowded, so the floor space needed for the payment stations may not be available without considerable construction expense.

Third, we accepted the vendor-supplied benefits assumptions for labor savings, increased sales, and reduced "cashier sweethearting." Without having tested the self-checkout systems in a commissary, we believe those assumptions carry moderate to high risk.

Finally, we assumed that DeCA customers would accept and use self-checkout systems. We believe this assumption carries moderate to high risk. All of the self-checkout vendors acknowledge that customers perceive they are checking out faster when they use self-checkout systems, when in fact they are checking out slower than a trained cashier. As a result, the systems could cause customer queues to increase. In addition, retirees comprise 40 percent of DeCA's customer base and may prefer to be serviced by a cashier.

WAIT AND SEE

Based on our analysis, self-checkout systems are expensive, have lengthy payback periods, and carry several significant risks. We recommend that DeCA continue its wait and see position regarding self-checkout systems. This will enable DeCA to monitor the market and analyze:

- *New self-checkout technologies that emerge*—For example, NCR (in association with Bell Labs) is investigating new, camera-based imaging technology that will be used to verify the identity of PLU items, resolving the PLU security issue and reducing the need for cashier intervention.

- *Technology improvements the self-checkout vendors make as a result of the existing test and pilot sites*—For example, self-checkout vendors may enhance their software and improve the interface to supermarket POS applications.

- *If the large POS vendors (NCR, IBM, Fujitsu-ICL, etc.) introduce new and better self-checkout systems*—At present, NCR is the only large POS vendor currently involved in self-checkout technology. We believe that if their system is successful, the other large POS vendors (IBM and Fujitsu-ICL) may enter the market and develop new self-checkout systems.

- *Whether increased competition results in lower prices*—If self-checkout technology improves and new systems enter the market that appear attractive, competition may result in lower prices and a payback period within two years.

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Chapter 1
Introduction

BACKGROUND

The Defense Commissary Agency (DeCA) supports the operation of more than 300 commissaries worldwide. In February of 1996, DeCA awarded a contract to NCR Corporation to replace its outdated, disparate point of sale (POS) systems with a new, state-of-the-art POS system that will enable it to improve efficiency, reduce operating costs, and add new functions such as electronic shelf labels, electronic funds transfer, and electronic marketing.

DeCA's new POS system processes customer orders using the traditional method where cashiers scan and weigh items, process coupons, and accept payment. In contrast, several commercial grocers are testing self-checkout systems. Self-checkout allows customers to process and sometimes pay for their purchases without cashier assistance. Some grocery industry analysts believe that self-checkout technology has the potential to substantially change grocery operations and significantly reduce supermarket labor costs. If true, this technology could help DeCA reduce its appropriated funding, which last year totaled almost $960 million.

As a result, DeCA tasked Logistics Management Institute (LMI) to perform an independent analysis of the self-checkout systems available in the marketplace and recommend if DeCA should consider installing them.

PURPOSE AND SCOPE

In this report, we present an independent analysis of self-checkout systems and recommend whether DeCA should implement them, test them, or maintain a "wait and see" position. To develop our recommendation, we:

♦ conducted a market survey by analyzing existing and planned self-checkout technologies and reviewing self-checkout pilot tests performed by both DeCA and commercial grocers;

♦ performed a financial analysis to compare self-checkout costs and benefits, and determine payback period; and

◆ conducted a sensitivity analysis on the cost information we received from the vendors and a risk analysis on the key assumptions we made while performing the financial analysis.

REPORT ORGANIZATION

The remainder of our report is organized into chapters as follows:

◆ *Chapter 2, Market Survey*—In this chapter, we describe the three self-checkout systems available today, identify two others that are currently under development, and discuss the market penetration of self-checkout systems in the supermarket industry.

◆ *Chapter 3, Financial Analysis*—In this chapter, we describe the objective and methodology of our financial analysis, calculate the costs and benefits of the three self-checkout systems currently available, and determine the payback period for each system.

◆ *Chapter 4, Sensitivity and Risk Analysis*—In this chapter, we analyze the sensitivity of payback period to hardware cost, and we discuss the risks of investing in self-checkout systems.

◆ *Chapter 5, Recommendations*—In this chapter, we recommend whether DeCA should consider installing self-checkout systems in its commissaries.

◆ *Appendix A, Self-Checkout Excursions*—In this appendix, we present our findings on two excursions requested by DeCA's Director. In the first excursion, we perform a financial analysis and determine the payback period for replacing all conventional checklanes with self-checkout lanes in a five lane commissary. In the second excursion, we perform a financial analysis and determine the payback period for replacing two conventional check-lanes with one express self-checkout system in a 21 lane commissary.

◆ *Appendix B, Detailed System Descriptions*—In this appendix, we provide detailed descriptions of the three self-checkout systems currently available.

◆ *Appendix C, Detailed Cost/Benefit Calculations*—In this appendix, we show the detailed life cycle costs and benefits for each self-checkout system.

Chapter 2
Market Survey

In this chapter, we describe the self-checkout systems currently on the market, identify two systems currently under development, and discuss the market penetration of self-checkout systems in the supermarket industry.

EXISTING SELF-CHECKOUT SYSTEMS

To date, three companies have fielded retail self-checkout systems, each with a unique approach:

♦ *Productivity Solutions, Inc.*—Their *Automated Checkout Machine* (ACM) is a full-service checklane.

♦ *Optimal Robotics/Spectra Physics PSC, Inc.*—Their product, called *U-Scan Express,* is intended exclusively for express transactions.

♦ *Symbol Technologies, Inc.*—Their *Personal Shopping System* is based upon portable self-scanning.

In the following sections we provide a brief overview of each self-checkout system. Appendix B provides a more detailed discussion of each system.

Productivity Solutions, Inc.

Productivity Solutions, Inc. (PS Inc.), based in Jacksonville, Florida, is a small U.S. firm with $2 million in 1996 revenue. It specializes in time and attendance software as well as ACM hardware and software.

PS Inc. acquired CheckRobot from Uniquest in 1994. The ACM is an updated version of the original CheckRobot version and is designed to handle any size order (see Figure 2-1). Presently, five North American retailers have 12 ACM systems in operation.

Figure 2-1. Productivity Solutions' Automated Checkout Machine
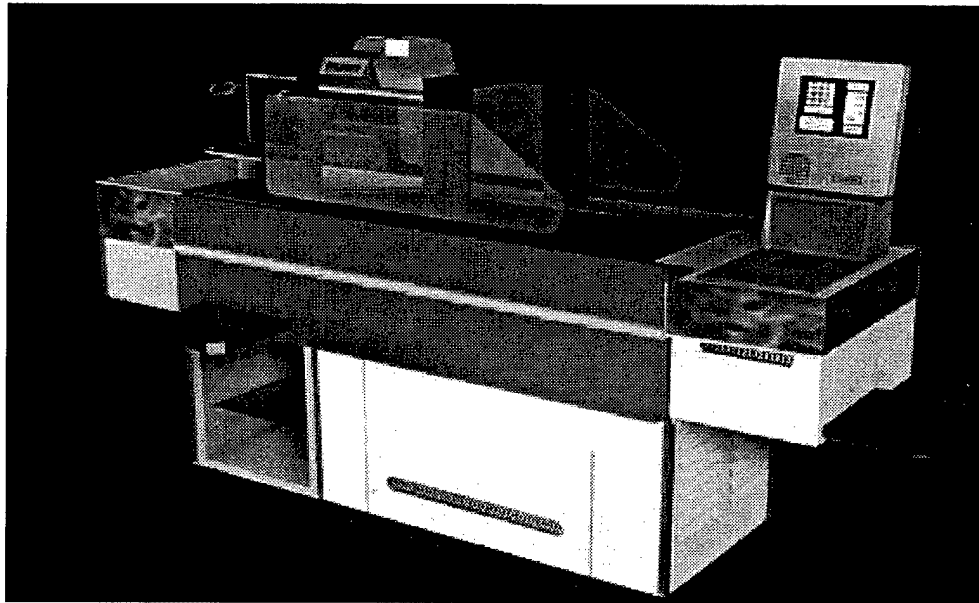
To operate the system, the customer scans each item and places it on a conveyor belt, which takes the item through a security zone where the system verifies the height, width, and weight of the item against a database. Items whose dimensions do not match those in the database are returned for a re-scan. Customers use a small book located next to the scanner/scale to determine the price lookup codes for items without barcodes. Each PS Inc. checklane replaces one conventional checklane, and one payment station is required to support a maximum of four ACM checklanes. While one model of PS Inc.'s checklanes can accept electronic payments, customers paying with cash, checks, or coupons must visit the payment station.

Optimal Robotics/Spectra Physics PSC, Inc.

Spectra Physics PSC, Inc. had over $210 million gross sales in 1995. It has a worldwide organization that specializes in barcode scanners, scanner/scales, and warehouse scanning systems. In December 1995, Spectra Physics, a leader in the worldwide scanner market, established a strategic alliance with Optimal Robotics, a leading software developer and integrator, to increase sales and accelerate market growth of the U-Scan Express self-checkout system. In July 1996, Spectra Physics was acquired by PSC, Inc., based in Rochester, New York.

The U-Scan system typically consists of four checkout stations (see Figure 2-2) and one cashier station and is designed for express purchases only. Currently, six U.S. supermarket chains have eight U-Scan systems installed.

Figure 2-2. Spectra Physics PSC's U-Scan Express Checkout Station
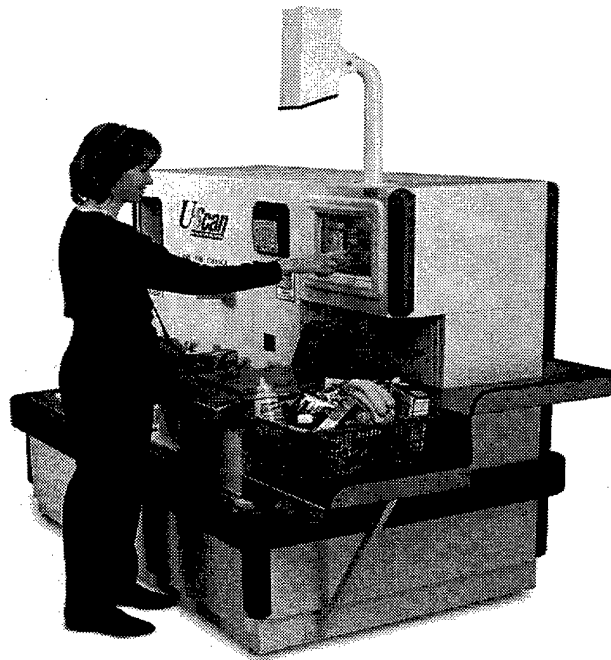
The customer can scan, bag, and pay at one U-Scan station. Customers scan each item and place them in one of three bags, each located on a scale. The system registers the weight and verifies it against a security database. The cashier at the cashier station views the operation of each checkout station through a video camera. If an item needs to be weighed, the customer places the item on the scale and presses the "no barcode" key on the customer display. The cashier then remotely enters the appropriate price lookup code for the item.

Cash and electronic payments can be made at the checkout station. However, the cashier is involved in constantly monitoring four checkout stations, intervening for items that do not have barcodes, and handling checks and coupons.

Symbol Technologies, Inc.

Located in Bohemia, New York, Symbol Technologies, Inc. is a large firm with $555 million in 1995 revenue. It has offices worldwide, and is the industry's leading supplier of portable barcode scanning systems.

Symbol manufactures the "Portable Shopping System"(PSS), which consists of portable data terminals/scanners which allow customers to scan the barcodes of items as they shop and a dispenser unit for those portable terminals. The system was co-designed by Ahold, a Dutch firm that owns Albert Heijn, Europe's largest supermarket chain and five supermarket chains in the U.S., and TNO Product

Centre, a Dutch engineering design firm. As with the PS, Inc. ACM solution, the Symbol solution can be used for orders of all sizes. Symbol has installed their system in approximately 71 stores. Sixty-eight of those are located in the Netherlands and England. Only three stores are located in the United States.

Each customer must be issued a special card to gain access to one of the portable terminals from the dispenser located at the store's entrance. Each hand-held device, shown on the left in Figure 2-3, has a "plus," a "minus," and an "equals" key. The customer scans each item after removing it from the shelf and presses the "plus" button. To return the item to the shelf, the customer re-scans the item and presses the "minus" button. After pressing the "equals" button, the display shows the running total of the number of items scanned and the purchase subtotal. When finished shopping, the customer returns the terminal to the dispenser (shown on the right in Figure 2-3) where an itemized bill is automatically printed. Payment must be made at a separate pay station.

Figure 2-3. Symbol Technologies' Portable Shopping System
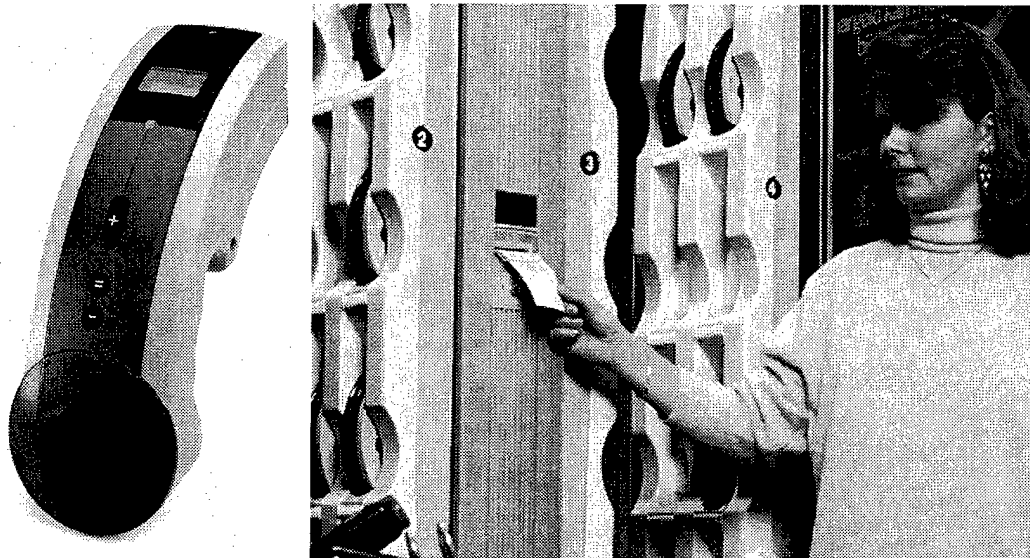
PSS can minimize customer checkout time and reward valued customers for their patronage. Periodic audits, which consist of a complete re-scan of customer orders, are required and could place the customer in an embarrassing situation. The audits are scheduled on a random basis, and are based on how many times the customer has used the system and their historical accuracy using the system. A customer could be audited anywhere from each shopping trip to once every sixteen shopping trips.

Emerging Self-Checkout Systems

Two POS vendors are introducing new self-checkout systems. Stores Automated Systems, Inc. (SASI) recently installed a beta version of their SASI eXPRESS system, and NCR Corporation plans to introduce their express self-checkout system, called SCOT, within one year.

STORES AUTOMATED SYSTEMS, INC.

Stores Automated Systems, Inc., based in Bristol, Pennsylvania, is an industry leader in providing integrated PC-based POS systems to retailers. More than 7,000 SASI systems are installed in North and Central America as well as the Caribbean.

SASI recently installed the eXPRESS self-checkout system (see Figure 2-4) in a Rite Aid pharmacy. This is the newest entrant in the self-checkout market. The system is designed to provide front-end flexibility and modular design.

Figure 2-4. Stores Automated Systems' SASI eXPRESS
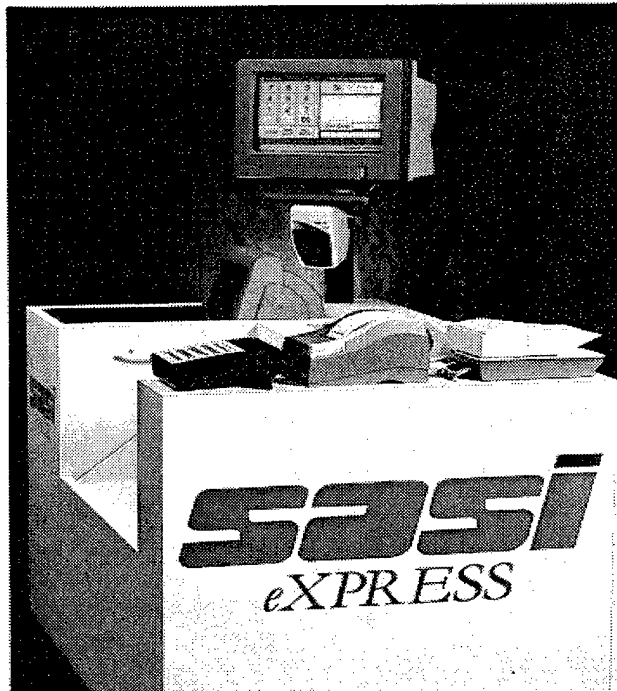
Two to four eXPRESS units can be configured and monitored by a single cashier placed in the middle of the units. The customer takes merchandise from the shopping cart, scans it, and places it in one of two bags. A scale under each bag registers the weight and makes sure the incremental weight is within established tolerances. Items that must be weighed are either handled by the cashier or the

customer, who selects the item from a graphical touch screen. Customers can make electronic payment at the checkout station, but the cashier must handle all other forms of payment.

NCR CORPORATION

The NCR Corporation, with $8.2 billion in 1995 revenue, is the industry leader in POS systems and a major worldwide provider of computer products and services to customers in all industries.

NCR is also developing an express self-checkout solution. NCR's stated approach is to design a system which incorporates the strengths of the existing systems while focusing on greatly limiting cashier involvement, making the system as "customer friendly" as possible, and providing seamless, real-time integration with the POS software (instead of batch file integration). Additionally, NCR plans to integrate an automatic teller capability into their system.

NCR hopes to have a prototype available for lab testing by January 1997 and a fully functional model ready for testing in a retail supermarket by the end of 1997. NCR's goal is to achieve a system payback of no longer than one year—the period that they believe will be attractive to a large share of the retail grocery industry.

SUPERMARKET INDUSTRY ACCEPTANCE

In 1987, DeCA tested Uniquest's CheckRobot. (PS Inc. acquired CheckRobot from Uniquest in 1994.) DeCA experienced several problems with the system including lack of customer acceptance, a continual need to train new customers on the use of the equipment, excessive equipment downtime, lack of security features, and a continuous requirement for front-end file maintenance.

Considering that the PS Inc. system has been available for more than ten years, and the U-Scan and Symbol systems have both been available for approximately three years, the supermarket industry has been slow to embrace the technology. As Table 2-1 shows, only 23 U.S. supermarkets have installed self-checkout systems, and most of those are one store pilot sites. The Symbol system is more prevalent in Europe, where 40 Safeway stores in the United Kingdom and 28 stores in the Netherlands have installed it.

We discussed self-checkout technology with executives from Kroger and A & P. In general, they were attracted to the technology because they wanted to determine if it could reduce labor costs and attract customers. However, they believe that the systems are expensive and can only provide sufficient return if a large percentage of customers use it (and use it correctly, without requiring cashier intervention). The executives indicated that store personnel play a key role in encouraging customers to use the system. They believe that the stores that closely assist customers

for at least six weeks after installation and implement a promotional campaign will enjoy much more success than those who simply install the systems with little or no advertising or customer support. In all, the executives believe that self-checkout systems will be more prevalent in the future, but they would like the vendors to reduce the cost and enhance some key features including security and price lookup for weighed items.

Table 2-1. Supermarket Industry Acceptance

PS Inc.		U-Scan		Symbol	
Retailers	# of stores	Retailers	# of stores	Retailers	# of stores
Kroger (OH)	2	Kroger (KY)	3	Safeway (U.K.)	40
Finast (OH)	3	Price Chopper	1	Finast (OH)	1
A & P (NJ)	1	Kroger (TX)	1	Wal-Mart	1
Overwaitea	1	Safeway	1	Albert Heijn	28
Pathmark	5	Shaw's (MA)	1	Super Quinn	1
		Price Club	1		
Total stores	12	Total stores	8	Total stores	71
				OCONUS stores	68

Chapter 3
Financial Analysis

In this chapter, we describe the objective and methodology of our financial analysis, calculate the costs and benefits of the three self-checkout systems currently available, and determine the payback period for each system.

OBJECTIVE, METHODOLOGY, AND ASSUMPTIONS

The objective of our financial analysis is to compare the costs and benefits of the three self-checkout systems currently available. However, each of the systems has a different approach to self-checkout as well as a different pricing strategy. The PS Inc. solution, intended for use by customers with all order sizes, is priced by individual checklane and pay station. The U-Scan system (Optimal Robotics/Spectra Physics PSC, Inc.), intended for express transactions only, is priced by the "system," defined as four checklanes and one pay station. And finally, the Symbol system, intended for transactions of all sizes, is priced by dispenser unit (which supports hand-held scanners in increments of 32) and by individual hand-held scanner.

To perform a consistent financial analysis of these disparate systems, we compared the life cycle costs and benefits of a conventional commissary (operating the new POS equipment supplied under the POS Modernization Contract) with those of three identical commissaries, each configured with one of the self-checkout systems.

In comparing the costs and benefits, the key metric that we calculated was the payback period. Payback period is the time required for a self-checkout system's accrued financial benefits to equal its investment costs. During our interviews with supermarket executives, they indicated that for self-checkout systems to be financially attractive, they would need to provide a payback period of about two years.

To calculate life cycle costs and benefits, we made the following assumptions:

♦ The baseline commissary configuration is 10 conventional lanes. (Using the POS Modernization database, we determined that an "average" commissary has 10 lanes.)

♦ The conventional and self-checkout equipment have an eight year life cycle.

The vendor recommended configurations are:

♦ PS Inc.—seven conventional checklanes, three ACM checklanes, and one ACM pay station

♦ U-Scan—eight conventional checklanes, four U-Scan lanes, and one U-Scan pay station

♦ Symbol—seven conventional lanes, one 64-unit dispenser with 64 hand-held devices, and one Symbol pay station.

Life cycle costs are composed of investment costs and operating and support costs. The investment costs include hardware, software, and services. The operating and support costs include hardware and software maintenance and sustainment training.

LIFE CYCLE COSTS

Table 3-1 summarizes the life cycle costs for each system. Appendix C shows the detailed calculations supporting those costs.

Table 3-1. Life Cycle Costs (thousands of dollars)

System	Investment costs	Operating and support costs	Life cycle cost
Baseline commissary	226	82	308
PS Inc.	403	147	550
U-Scan	400	169	569
Symbol	497	139	636

As Table 3-1 shows, the self-checkout systems are expensive, with life cycle costs ranging from 80 to 110 percent higher than those for the conventional POS system.

Figure 3-1 shows the proportions of life cycle costs that are allocated to investment costs versus those allocated to operating and support costs.

*Figure 3-1. Investment Versus Operating and Support Costs
(thousands of dollars)*
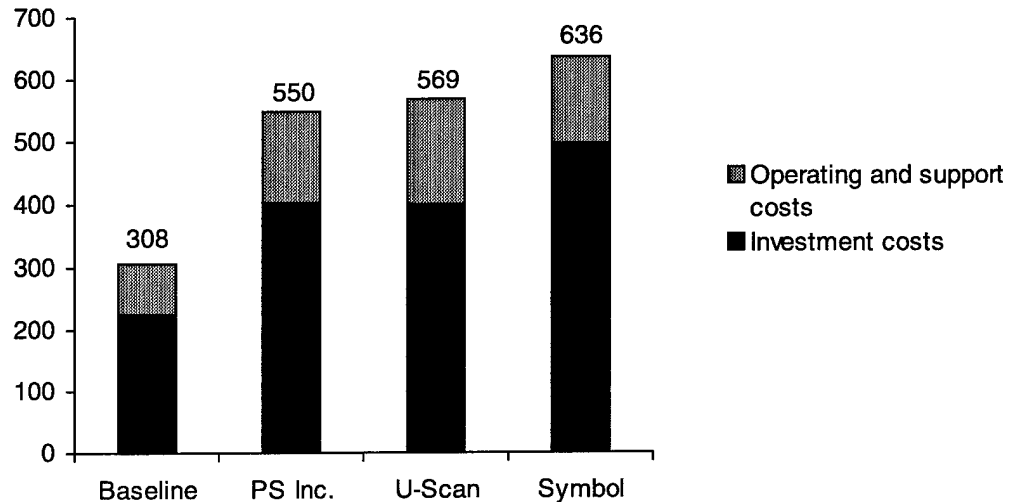
As Figure 3-1 shows, investment cost comprises the majority of life cycle costs. In addition, the operating and support costs are similar for all three self-checkout systems, but twice as expensive as those for the conventional system.

To extrapolate these costs agency-wide, we assumed DeCA would consider installing self-checkout systems in commissaries with more than ten lanes (approximately 150). If so, DeCA would spend an additional $36 to $49 million in life cycle costs by installing self-checkout systems.

LIFE CYCLE BENEFITS

We identified two types of self-checkout benefits—non-quantifiable and quantifiable. The non-quantifiable benefits include:

♦ *Improved customer service*—Customers *perceive* that they are checking out faster if they scan their own items, even though studies clearly indicate that trained cashiers scan and tender transactions significantly faster than customers.

♦ *Improved store image*—Customers think highly of stores that strive to remain current with new technologies.

While these non-quantifiable benefits would be helpful for DeCA, they are probably not as important to DeCA as the quantifiable benefits.

The quantifiable benefits impact either appropriated funding or the DeCA surcharge. Cashier labor savings would reduce appropriated funding. By installing self-checkout systems, stores can reduce the number of cashier hours required. We believe that this benefit is the most important to DeCA because it directly affects appropriated funding requirements.

Increased sales and reduced "cashier sweethearting" [1] would increase DeCA's surcharge account. Self-checkout vendors claim that their systems will foster customer loyalty as well as attract new customers, and therefore increase sales. In addition, due to the reduction in cashier labor hours, "cashier sweethearting" will be reduced.

Each self-checkout vendor provided us with assumptions to use in calculating the quantifiable benefits. Appendix C shows those assumptions as well as the detailed calculations supporting the benefits estimates.

Figure 3-2 shows the life cycle benefits for each self-checkout system including the relative proportions of labor savings and surcharge increase.

Figure 3-2. Life Cycle Benefits (thousands of dollars)
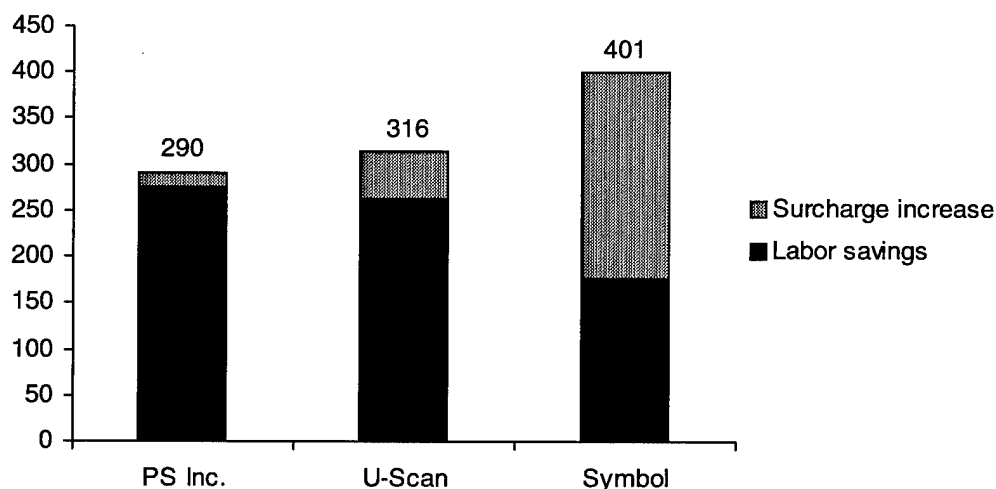
As Figure 3-2 shows, the life cycle labor savings for PS Inc. and U-Scan are comparable, with U-Scan generating greater surcharge benefit. Symbol, on the other hand, generates significantly more surcharge benefits and significantly less labor savings.

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[1] "Cashier sweethearting" is a term used to describe a process whereby a cashier colludes with a customer to circumvent the normal scanning or pricing of an item at the checkout station.

COMPARING LIFE CYCLE COSTS AND BENEFITS

Table 3-2 shows the incremental life cycle costs for each self-checkout system and the corresponding benefits that offset those additional costs. We calculated the incremental life cycle costs by subtracting the life cycle costs for the conventional system ($308,000) from those for each self-checkout system.

Table 3-2. Life Cycle Costs and Benefits (thousands of dollars)

Self-checkout system	Life cycle labor savings	Life cycle sur-charge benefits	Total benefits	Incremental life cycle costs
PS Inc.	276	14	290	242
U-Scan	263	52	315	261
Symbol	176	225	401	328

The life cycle labor savings exceeds the additional self-checkout life cycle costs for both PS Inc. and U-Scan, but not for Symbol. However, Symbol's surcharge benefits combined with their labor savings do exceed their additional costs.

Figures 3-3, 3-4 and 3-5 illustrate the payback periods for each self-checkout system.

Figure 3-3. PS Inc. Payback
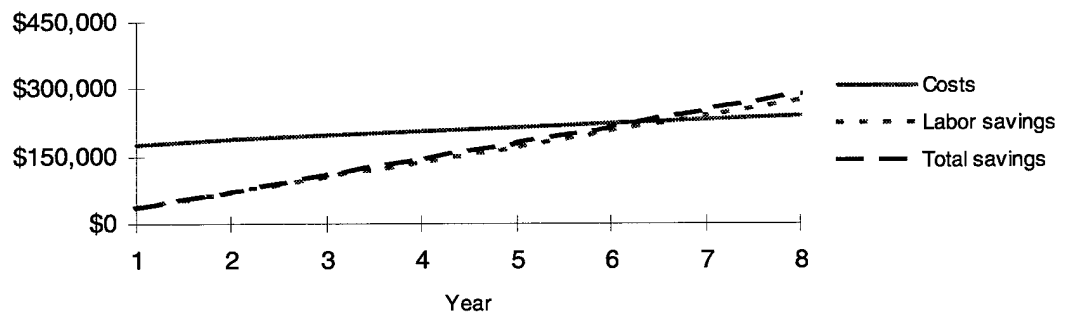
Because the PS Inc. system has relatively low surcharge benefits, the labor payback period and the total payback period (labor and surcharge benefits combined) are approximately the same at six and one-quarter years.

Figure 3-4. U-Scan Payback
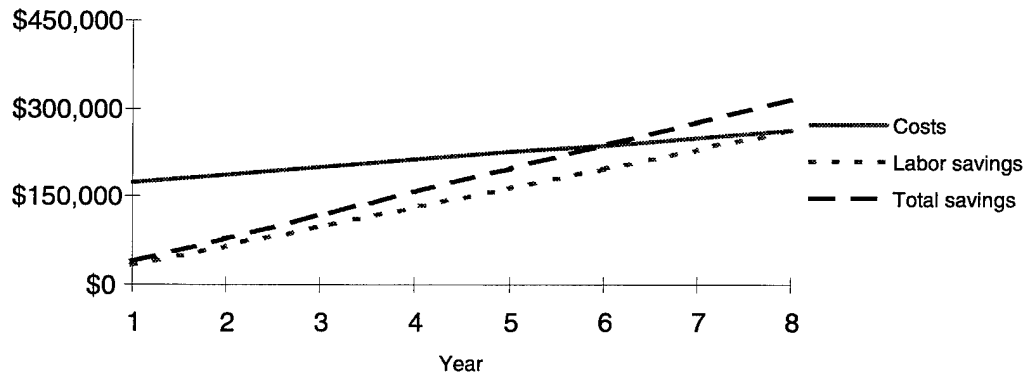
The U-Scan system has a labor payback period of eight years—the end of the life cycle—and a total payback of six years.

Figure 3-5. Symbol Payback
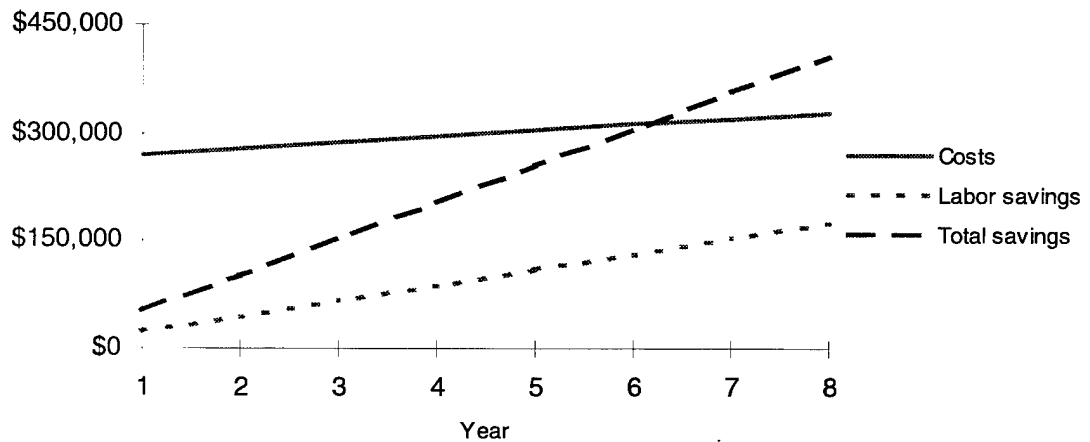
The Symbol system does not have a labor payback within the life cycle, but due to its large surcharge benefits, it has a total payback of six years.

In sum, none of the three self-checkout systems has a payback period within the two year threshold that supermarket executives believe is necessary to make it an attractive investment.

Chapter 4
Sensitivity and Risk Analysis

Before developing our recommendations, we conducted a sensitivity analysis on the cost information supplied by the vendors, and a risk analysis on the key assumptions we made while performing the financial analysis.

SENSITIVITY ANALYSIS

Given that our calculations were based upon cost information supplied by the vendors, we wanted to assess the sensitivity of system payback to changes in labor rates and hardware cost.

We found that system payback was relatively insensitive to increases in labor rates. After increasing the labor rates by four percent per year, the system payback period for all three systems decreased by less than one year.

In contrast, system payback was more sensitive to reductions in hardware cost. Based upon our experience with the POS Modernization program, we felt that DeCA could receive as much as a fifty percent discount from the prices quoted to us by the vendors on the self-checkout hardware (assuming a competitive two or three year acquisition cycle). Table 4-1 compares the labor and total payback with that hardware discount.

Table 4-1. Payback Comparison with Hardware Discount (years)

System	Current labor payback	Labor payback with a 50% hardware discount	Current total payback	Total payback with 50% hardware discount
PS Inc.	6.25	5.50	6.25	5.50
U-Scan	8.00	4.25	6.00	3.25
Symbol	15.00	9.50	6.00	3.50

Note: Total payback includes labor savings and impact on surcharge account.

As Table 4-1 shows, the payback changed from 6.25 to 15 years to 3.25 to 5.5 years. While still outside the two year payback range that we believe is needed, a fifty percent reduction in hardware cost makes self-checkout investments appear more attractive.

RISK ANALYSIS

In performing the financial analysis, we made several key assumptions, all of which have associated risks. First, we assumed that the self-checkout systems would interface to DeCA's NCR Unity platform with little or no difficulty. We believe that assumption carries moderate to high risk. The U-Scan Express system is the only self-checkout system that has been successfully integrated with Unity (at Kroger), and Optimal Robotics spent more than one year working on that interface. Therefore, software integration could be a time-consuming and expensive task.

Second, we assumed that the commissaries would not require major facility modifications to accommodate the self-checkout systems. Based upon DeCA's experience with the POS Modernization Program, this assumption carries high risk. The checkout area in many commissaries is crowded, so the floor space needed for the payment stations may not be available without considerable construction expense.

Third, we accepted the vendor-supplied benefits assumptions for labor savings, increased sales, and reduced "cashier sweethearting". Without having tested the self-checkout systems in a commissary, we feel those assumptions carry moderate to high risk. Fourth, we assumed that DeCA customers would accept and use the self-checkout systems. Given that 40 percent of DeCA's customer base is composed of retirees, we believe this assumption carries moderate to high risk.

Last, we assumed that DeCA would consider installing any of the self-checkout systems currently available. All of those systems have weaknesses that may be unacceptable to DeCA. All of the self-checkout vendors acknowledge that customers perceive they are checking out faster when they use self-checkout systems, when in fact they are checking out slower than a trained cashier. As a result, the systems could cause customer queues to increase.

Price lookup (PLU) security is one weakness in both the PS Inc. and Symbol systems. Customers are responsible for identifying, weighing, and pricing all items without barcodes. Unless a cashier or other store employee watches as they key in the PLU codes, customers could easily enter PLU codes for less expensive items. While the Symbol system uses random audits to encourage customer accuracy, those audits are cumbersome for the customer because a cashier must re-scan the entire order. In addition, the systems cannot prevent customers from leaving the store without paying for their orders (walkouts). One large grocery chain reported that the benefits they gained from reduced cashier shrink were offset by customer walkouts.

Last, a cashier must intervene to take payment from all customers that use coupons, purchase restricted items (tobacco products), or pay with food stamps or Women, Infants, and Children (WIC) vouchers. DeCA may be unwilling to accept these security risks, operational problems, and customer inconveniences.

Chapter 5
Recommendations

While some self-service systems (like automated teller machines at banks and express payment machines at gasoline stations) have proven successful, the retail grocery industry has not yet embraced self-checkout technology. Retailers who are currently implementing test or pilot self-checkout systems are serving as pathfinders. In our opinion, self-checkout systems are clearly not attractive because they are very expensive, and their benefits do not result in a payback in two years or less.

We recommend that DeCA continue its wait and see position regarding self-checkout. This will enable DeCA to monitor the market and analyze:

♦ *New self-checkout technologies that emerge*—For example, NCR (in association with Bell Labs) is investigating new, camera-based imaging technology that will be used to verify the identity of PLU items, resolving the PLU security issue and reducing the need for cashier intervention.

♦ *Technology improvements the self-checkout vendors make as a result of the existing test and pilot sites*—For example, self-checkout vendors may enhance their software and improve the interface to supermarket POS applications.

♦ *If the large POS vendors (NCR, IBM, Fujitsu-ICL, etc.) introduce new and better self-checkout systems*—At present, NCR is the only large POS vendor currently involved in self-checkout technology. We believe that if their system is successful, the other large POS vendors (IBM and Fujitsu-ICL) may enter the market and develop new self-checkout systems.

♦ *Whether increased competition results in lower prices*—If self-checkout technology improves and new systems enter the market that appear attractive, competition may result in lower prices and a payback period within two years.

Appendix A
Self-Checkout Excursions

In this appendix, we provide the financial analysis for the self-checkout excursions requested by the Director of the Defense Commissary Agency.

We presented our preliminary findings to DeCA's Director on 5 September 1996. After that briefing, he requested that we analyze two additional self-checkout scenarios. We refer to those scenarios as Excursions 1 and 2. In Excursion 1, a small five lane commissary is configured with self-checkout only. (No conventional checklanes remain.) In Excursion 2, a large 21 lane commissary is configured with one express self-checkout system. This appendix details the costs, benefits, and payback period of the two excursions.

We selected the Productivity Solutions Inc. (PS Inc.) Automated Checkout Machine (ACM) system and the Symbol Portable Shopping System for Excursion 1 since both were designed for orders of all sizes. We selected the Optimal Robotics/Spectra Physics PSC, Inc. U-Scan system for Excursion 2 since that system is designed solely for express checkout.

The assumptions we used are basically the same as detailed in Chapter 3 except the baseline commissary configuration is five lanes for a small store and 21 lanes for a large store. The self-checkout configurations we used for our calculations are:

◆ PS Inc.—no conventional checklanes, five ACM checklanes, and two ACM pay stations

◆ Symbol—no conventional lanes, one 64-unit dispenser with 64 hand-held devices, and two Symbol pay stations

◆ U-Scan—19 conventional checklanes, four U-Scan lanes, and one U-Scan pay station.

EXCURSION 1—SMALL STORE, ALL SELF-CHECKOUT

To convert small commissaries entirely to self-checkout is expensive. As shown in Table A-1, life cycle costs range from 118 to 136 percent higher than those for the conventional point of sale (POS) system.

Table A-1. Excursion 1 Incremental Costs (thousands of dollars)

System	Self-checkout life cycle costs	Baseline	Incremental costs
PS Inc.	504	231	273
Symbol	546	231	315

Note: The baseline store consists of five conventional NCR lanes.

As discussed in the main body of the report, we identified two types of self-checkout benefits—quantifiable and non-quantifiable. As Table A-2 shows, the total benefits of the two self-checkout systems are comparable. However, the majority of PS Inc.'s benefits are labor savings, while Symbol has greater surcharge benefits.

Table A-2. Excursion 1 Life Cycle Benefits (thousands of dollars)

System	Life cycle labor savings	Life cycle surcharge benefit	Total benefits
PS Inc.	552	6	558
Symbol	241	271	512

The life cycle labor savings for PS Inc. exceed the incremental life cycle costs. Because PS Inc. has very little surcharge benefit, the labor payback period and the total payback period are basically the same at three and one-quarter years (see Figure A-1). While this payback represents a significant improvement over the configuration discussed in Chapter 3, it is still longer than the two year threshold that many supermarket industry executives prefer. Perhaps more importantly, we believe that significant risks are associated with an all self-check-out store, especially customer acceptance and security. In addition, cashiers that work in small commissaries often have other responsibilities, including customer service, back office management, and clean up duties. These other responsibilities increase the risk that DeCA may not realize the labor benefits that the vendors claim.

Figure A-1. Excursion 1 PS Inc. Payback
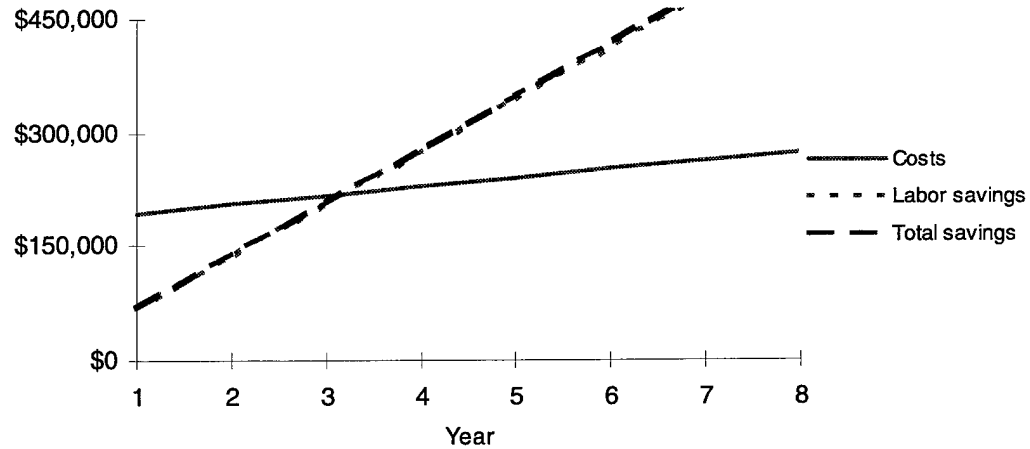
Symbol also showed an improvement in payback from that detailed in the main report; however, the labor payback (ten and one-half years) exceeds the system's life cycle. The total payback is about five years (Figure A-2) and is much greater than the two year threshold.

Figure A-2. Excursion 1 Symbol Payback
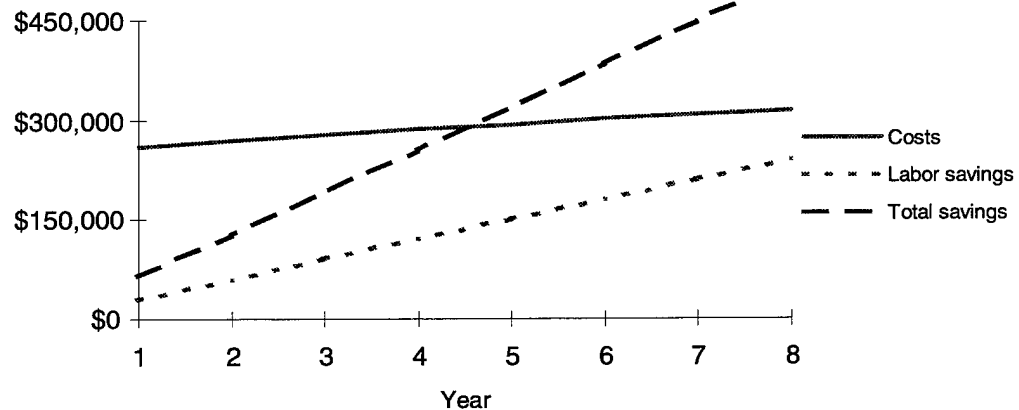
EXCURSION 2—LARGE STORE, ONE EXPRESS SELF-CHECKOUT SYSTEM

As Table A-3 shows, life cycle costs are approximately 58 percent greater if the U-Scan self-checkout system is installed in a 21 lane commissary.

Table A-3. Excursion 2 Incremental Costs (thousands of dollars)

System	Self-checkout life cycle costs	Baseline	Incremental costs
U-Scan	750	475	275

Note: The baseline store consists of twenty-one conventional NCR lanes

As Table A-4 shows, one U-Scan system (four checklanes and one pay station) in a 21 lane commissary generates both labor savings and surcharge benefit. The majority of the labor savings result from reducing the number of cashier hours required.

Table A-4. Excursion 2 Life Cycle Benefits (thousands of dollars)

System	Life cycle labor savings	Life cycle surcharge benefit	Total benefits
U-Scan	338	210	548

U-Scan's life cycle labor savings exceed the incremental life cycle costs. The labor payback period is about six years (see Figure A-3) compared to eight years for the ten lane system discussed in the main report. The total payback is about three years, which is much better than the six year payback for the ten lane system, but still greater than the two year threshold.

Figure A-3. Excursion 2 U-Scan Payback
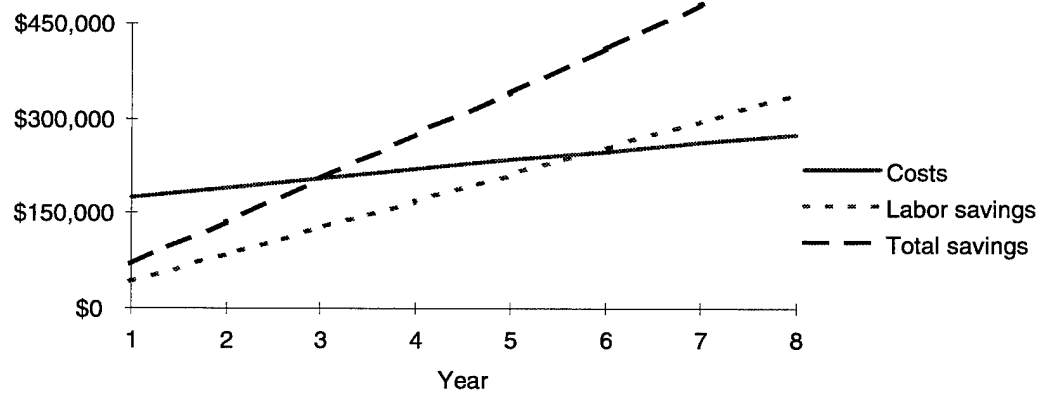
SUMMARY

Although the total payback period for each of the three self-checkout systems improved over those calculated for the systems configured for a 10 lane commissary, all exceeded a two year payback and present many risks. As a result, we stand by our recommendation to maintain a "wait and see" attitude regarding self-checkout.

Appendix B
Detailed System Descriptions

In this appendix, we provide detailed descriptions of the self-checkout systems summarized in Chapter 2, Market Survey.

PRODUCTIVITY SOLUTIONS, INC.

Productivity Solutions, Inc. (PS Inc.), based in Jacksonville, Florida, was formed in 1994 when the "Automated Checkout Machine" (ACM) and Time and Attendance business units separated from Uniquest to form an independent organization. Prior to 1994, Uniquest had developed and marketed its self-checkout "CheckRobot" solution for approximately eight years. The ACM is an updated version of the original CheckRobot, which the Defense Commissary Agency (DeCA) tested in the Pensacola, Florida commissary in the mid-1980s.

System Overview

The PS Inc. ACM system consists of self-checkout lanes and payment stations. A PS Inc. ACM checklane consists of a full-sized checkstand with:

- an interactive, touch screen customer interface,

- a PS personal computer running their security application,

- a receipt printer,

- a proprietary security zone (through which all items must pass on a transfer belt), and

- a product accumulation area.

Each PS Inc. checklane replaces one conventional checklane (the footprints are virtually the same). A local area network links a PS Inc. controller in the back office to each PS Inc. personal computer (in the ACM checklane). PS Inc. also provides the network interface between its ACM system and the point of sale (POS) system.

One payment station is required to support a maximum of four PS Inc. checklanes. For each payment station, PS Inc. provides the cabinet and a hand-held scanner.

Currently written in C, the PS Inc. ACM software includes a data base of items, by universal product code (UPC) code, a corresponding weight and dimension field (with length, width, and depth), a promotional packaging field, and an item "not on file" field. The next software update, due out by the end of 1996, will be written in C++.

The retailer must provide a scanner/scale and a POS processing unit for each ACM checklane. Additionally, the retailer must provide a POS register and processing unit for each payment station.

Checkout Process

The PS Inc. ACM solution is designed to handle any size order. A customer brings his or her cart to the checklane, touches the display, and the system provides audible instructions. The customer scans each item with a UPC code and places it on the belt in the security zone. The system compares the weight and dimensions of the item to the security data base and either allows the belt to continue moving toward the accumulation area, or stops the belt, reverses it, and asks the customer to "try again." If the system stops the customer after two consecutive tries, the lane light flashes, indicating that a cashier should assist the customer. For items that require price lookup, the customer places the item on the scale, looks up the price lookup (PLU) code in a book located next to the register, enters the correct PLU code, and places the item on the belt in the security zone. A synthesized voice identifies the item after it is processed. PS Inc. plans to provide touch screen price look-up by December 1996.

The standard PS Inc. checklane accepts coupon scanning. One model of the PS Inc. checklane can accept electronic payments and process customer transactions without requiring the customer to visit the payment station. Customers paying with cash, check, or food stamps must pay at the payment station. All customers that purchase restricted items such as alcoholic beverages and tobacco products must provide identification and pay at the pay station.

Grocery Clients

As of July 1996, the following five chains were using the PS ACM machines: Kroger, A & P, Finast, Food Town, and Overwaitea. In addition, Winn Dixie recently contracted with PS Inc. to test ACM at one of their stores.

Benefits

PS Inc. claims that their ACM solution provides benefits to both the retailer and the customer. Those benefits are:

♦ Customers perceive that ACMs provide faster checkout, better service, and shorter lines

◆ Cashier productivity rises

◆ Retailers realize labor savings, allowing those hours to be allocated to customer service or to reducing the number of front end personnel

◆ Retailers experience a reduction in shrink

◆ Customers accept ACM rapidly and sustain that acceptance.

Risks

We identified the following risks associated with the PS Inc. solution:

◆ Small company size

◆ No worldwide presence

◆ Product acceptance is minimal with over 10 years of market availability

◆ Does not currently interface with NCR Unity systems

◆ System is hardware intensive with several proprietary components.

OPTIMAL ROBOTICS/SPECTRA-PHYSICS PSC, INC.

Spectra-Physics has been a leader in the worldwide retail/commercial/industrial scanner market since its first scanner was installed in Marsh Supermarkets in 1974. The company entered into a global strategic alliance with Optimal Robotics Corporation, a leading software developer and integrator, in December 1995 to increase sales and accelerate market growth of the U-Scan Express automated self-checkout system. On July 12, 1996, Spectra-Physics was acquired by PSC, Inc., based in Rochester, New York. PSC, Inc. manufactures scan engines and hand-held scanners. Spectra-Physics PSC intends to maintain the same relationship with Optimal Robotics as before the acquisition. Spectra-Physics PSC provides U-Scan hardware, installation and support, and marketing while Optimal Robotics provides ongoing software enhancements and customization services.

System Overview

The U-Scan Express system typically consists of four self-checkout stations and one cashier station. U-Scan operates on an industry standard PC-based platform using readily available "off-the-shelf" peripherals. The U-Scan's open architecture integrates easily with standard POS systems. A U-Scan self-checkout station consists of:

◆ a touch screen CRT with voice messaging,

- a Magellan® scanner/scale,

- electronic funds transfer

- a currency acceptor and dispenser,

- a weight platform,

- a POS printer, and

- a color surveillance camera.

One cashier station is required for every four U-Scan checkstations. For each cashier station, Spectra-Physics PSC provides:

- a split-screen CRT,

- a cash drawer,

- a POS style keyboard,

- a POS printer,

- electronic funds transfer,

- a four station color monitor and,

- a hand-held scanner.

Currently written in C++, the U-Scan software includes:

- a complete POS transaction set,

- UPC barcode scanning,

- PLU/weight calculation,

- multiple tender type,

- 100,000+ item file (including weight) and,

- a descriptive alpha-numeric receipt.

Kroger, Louisville is running NCR's Unity software, and has successfully integrated U-Scan Express with Unity.

A local area network links a Spectra-Physics PSC controller in the back office to each U-Scan checkout station and the cashier station. The POS system sends batch updates the U-Scan item file on a retailer-defined schedule.

Checkout Process

The U-Scan system is designed to replace traditional retail grocery express checklanes. Customers bring their carts to the checklane, U-Scan greets them with a colorful video image and instructs them to touch the computer screen to begin checkout. Customer are then instructed to scan all purchases. The U-Scan terminals are designed so the customer can, in one motion, remove a product from the shopping cart, pass it over the scanner, and place it directly into a waiting grocery bag. Each scanned item's weight is verified by an expert system against U-Scan's database as a first level security check.

A video camera system is used as a second level security check. A video snapshot is taken of every item entering the bag. To identify non-barcoded items, such as produce, the customer places the product on the scanner scale and alerts the cashier by pressing the "NO BAR CODE" button on the touchscreen. The cashier responds to the request by making the identification via an image of the item on a color video monitor. After the cashier presses the appropriate button on his or her screen, the U-Scan terminal instantly prices the item based on its weight, and the customer is asked to place the item in the grocery bag. The cashier is equipped with a handheld scanner to read barcodes on heavy, oversized items at any U-Scan station. To end the order the customer presses the "END ORDER" button.

Customers are given the choice of paying with a cash, a bank debit or credit card, check, or food stamps. Cash and electronic payment can be made at the checkout station. Other forms of payment, including coupons, must be made at the cashier station.

Grocery Clients

Several retailers are using or testing U-Scan including: Kroger, Ralphs Grocery, Price Chopper, Price Costco, Shaw's Supermarkets, and Star Markets.

Benefits

Spectra-Physics PSC claims the U-Scan system provides benefits to both the retailer and the customer. Those benefits include:

◆ More express lanes open during peak hours

◆ Customer has a choice of assisted or non-assisted checkout

◆ Increased front-end productivity through labor savings

♦ Reduced cashier related shrinkage (more accurate PLU number identification and virtually eliminating "cashier sweethearting").

Risks

We identified the following risks associated with the Optimal Robotics solution:

♦ If the cashier station goes down, the entire system goes down

♦ Cashier is responsible for too many tasks (non-scannable item entry, getting customer signatures on credit slips, entering coupons, monitoring up to four customer checkout lanes, and providing customer assistance)

♦ System is designed only for express orders.

SYMBOL TECHNOLOGIES, INC.

Symbol Technologies, Inc., headquartered in Bohemia, New York, is the world leader in bar code driven data transaction systems, with more than 2.5 million scanners and terminals installed. Symbol has been in business for 20 years. The company developed a self-service scanning system, the "Portable Shopping System" in cooperation with Ahold, a Dutch firm that owns Albert Heijn, Europe's largest grocery chain and five grocery chains in the U.S., and TNO Product Centre, a Dutch engineering firm. The first system was installed in April 1993 in a 10,000 square foot store in Geldermalsen, Holland.

System Overview

With the Portable Shopping System, customers scan the barcode of each item as they shop and pay for their goods at a pay station. The cashier processes any items on which the customer could not find a barcode, or items the customer indicates did not scan properly. The system includes periodic audits requiring all items to be re-scanned by the cashier to ensure that customers are using the system correctly.

The hardware consists of a scanner dispenser which stores, locks, and charges the scanners, and prints the customer's transaction ticket; DOS-based micro-computer scanners; and cart holders for the scanners. There are three standard dispenser sizes (32 slot with one ticket printer, 64 slot with two ticket printers, and a 96 slot with three ticket printers). Each scanner has a bar code reader, three keys ("plus," "minus," and "equals"), a two line by eight character display, and is configured with one of four memory options (512KB, 1MB, 2MB, and 4 MB) to cover all sizes of PLU files. The retailer can, for an additional cost, select a radio frequency (RF) LAN option. The cart holders are used to store the scanner on the shopping

cart while the customer shops, a feature customers find especially useful for scanning bulky items.

The software that controls the system is the Personal Shopping Application (PSA). The PSA controls the dispenser functions, maintains the customer data base, provides connections to the POS system, prints reports, and manages the rescan audit process. The system interfaces easily with point of sale systems that use IBM 4680/4690 Supermarket Application. Some software modification is required for retailers that use other POS systems.

A local area network links the Portable Shopping System controller PC to the store's POS system. The store's main item files are down-loaded into each scanner while they are stored in the dispenser. If the retailer chooses RF option, the scanners are updated whether they are in the dispenser or in use.

The retailer must provide the following components for the system:

◆ system controller PC,

◆ service desk transaction ticket printer,

◆ service desk report printer,

◆ service desk card reader (bar code or magnetic stripe reader),

◆ multiple port serial communication board,

◆ fresh fruit and vegetable weighing stations,

◆ reusable totes (optional), and

◆ specially designed shopping carts to facilitate in-cart bagging (optional).

Checkout Process

The Portable Shopping System is designed to decrease the time associated with "non-shopping activities," such as waiting in the checkout line and bagging merchandise. A customer who has been granted access to the scanner inserts a membership card into a reader on the dispenser unit. The dispenser releases a scanner, identified by a flashing light, which the customer can then place in the shopping cart holder.

To purchase an item, the customer presses the "plus" key and passes the product through the scanning beam to read its barcode. For items without barcodes, such as fresh fruit and vegetables, the item must be weighed and a printed barcode must be affixed to the package prior to scanning. Each time an item's barcode is scanned, its price is displayed, enabling the customer to check the scanned price

versus the price displayed on the shelf. Should a customer decide not to purchase an item, they press the "minus" key, re-scan the barcode, and return the item to the shelf. The customer can check the number of items purchased and the subtotal at any time by pressing the "equals" key.

After finishing shopping, the customer returns the scanner to the dispenser where a barcoded itemized bill is automatically printed. The customer proceeds with the bill to a dedicated express payment station where the security system advises the check-out operator to either take payment or re-scan (audit) the items. Re-scans are random, based on the shopper's profile maintained in the system.

Grocery Clients

Several European retailers are using the Portable Personal Shopping System including: Albert Heijn, Holland; and Safeway UK (not affiliated with Safeway, U.S.). The system is being tested in a Finast supermarket in Ohio. Other U.S. retailers projected to purchase or test the system are Super Clean and Sam's Club.

Benefits

Symbol believes the Portable Personal Shopping System provides benefits to both the retailer and the customer. Those benefits include:

♦ No need to queue at the checklane.

♦ Fewer checkstands are required; more space for product display provides the customer with more choices, increases revenues, and reduces labor costs.

♦ Real-time sales information aids in reducing out of stock items and determining customer preferences.

♦ System provides flexibility during peak periods and helps minimize errors in labor scheduling.

Risks

We identified several risks associated with the Symbol solution:

♦ Potential labor savings and potential increased sales may be overstated thus increasing the payback period.

♦ Security is extremely limited.

♦ Scanner reliability may be an issue; a check with a supermarket chain testing the system revealed 12 of 32 scanners were broken.

Appendix C
Cost/Benefit Calculations

This appendix shows the life cycle costs and benefits for each self-checkout system. For general release of this report beyond DeCA the detailed cost and benefit data has been removed.

PRODUCTIVITY SOLUTIONS, INC.

Table C-1. Life Cycle Costs—Productivity Solutions, Inc. ($)

Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Hardware									
Software (includes customization/integration)			**Proprietary data**						
Services									
Maintenance									
Total costs									

Table C-2. Total Life Cycle Costs—Productivity Solutions, Inc. ($)

Costs	Self-checkout	NCR system[1]	Total
Investment[2]			
Operating & support[3]	**Proprietary**		**data**
Life cycle			

[1]NCR costs were derived from the Defense Commissary Agency (DeCA) point of sale (POS) Modernization contract.

[2]Costs incurred during year one.

[3]Costs incurred during years two through eight.

Table C-3. Life Cycle Benefits—Productivity Solutions, Inc. ($)

Benefits	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Labor savings Surcharge impact			Proprietary data						
Total benefits									

Benefits Assumptions:

♦ The self-checkout system replaces three conventional lanes.

♦ Labor savings are calculated by reducing the number of cashier hours required. Specifically, cashier hours are required to operate one pay station, rather than three conventional lanes. Similarly, labor hours for cashier training, cashier hiring, and till countback are reduced.

♦ Shrink reduction is attributed to reduced "cashier sweethearting."

OPTIMAL ROBOTICS/SPECTRA PHYSICS PSC, INC.

Table C-4. Life Cycle Costs—Optimal Robotics/Spectra Physics PSC, Inc. ($)

Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Hardware Software Services Maintenance			Proprietary data						
Total costs									

Table C-5. Total Life Cycle Costs—Optimal Robotics/Spectra/Physics PSC, Inc. ($)

Costs	Self-checkout	NCR system[1]	Total
Investment[2] Operating & support[3] Life cycle		Proprietary data	

[1]NCR costs were derived from the DeCA POS Modernization contract.
[2]Costs incurred during year one.
[3]Costs incurred during years two through eight.

Table C-6. Life Cycle Benefits—Optimal Robotics/Spectra Physics PSC, Inc. ($)

Benefits	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Labor savings Surcharge impact			Proprietary data						
Total benefits									

Benefits Assumptions:

♦ The self-checkout system will replace two conventional lanes.

♦ Labor savings are calculated by reducing the number of cashier hours required to operate two conventional lanes. Cashier training, cashier hiring, and till countback for those two conventional lanes are also included in the labor savings.

♦ Shrink reduction is attributed to reduced "cashier sweethearting."

SYMBOL, INC.

Table C-7. Life Cycle Costs—Symbol, Inc. ($)

Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Hardware Software Services Maintenance					Proprietary data				
Total costs									

Table C-8. Total Life Cycle Costs—Symbol. Inc. ($)

Costs	Self-checkout	NCR system[1]	Total
Investment[2] Operating & support[3] Life cycle		Proprietary data	

[1]NCR costs were derived from the DeCA POS Modernization contract.
[2]Costs incurred during year one.
[3]Costs incurred during years two through eight.

Table C-9. Life Cycle Benefits—Symbol, Inc. ($)

Benefits	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Labor savings Surcharge impact					Proprietary data				
Total benefits									

Benefits Assumptions:

♦ The self-checkout system replaces two conventional lanes. Space for one lane is dedicated to the dispenser and one conventional lane is used for self-checkout—the net result is seven conventional lanes, one self-checkout payment lane, and floor area equivalent to one conventional lane's footprint for additional sales space.

♦ Labor savings are calculated by reducing the number of cashier hours required to operate two conventional lanes.

◆ Surcharge impact:

  ◈ Increased sales because more customers will be drawn to the store due to the self-checkout system.

  ◈ Increased sales because of the increased selling space.

  ◈ Shrink reduction due to customer accuracy and reduced "cashier sweethearting."

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13. ABSTRACT *(Maximum 200 words)*

The Defense Commissary Agency (DeCA) tasked LMI to perform an independent analysis of the self-checkout systems available in the marketplace and recommend whether DeCA should consider installing them. Based upon our analysis, we believe that existing supermarket self-checkout technology is too expensive and carries too much risk for DeCA at the present time. Therefore, we recommend that DeCA adopt a "wait-and-see" position on self-checkout systems.

Before formulating our recommendation, we conducted a market survey to identify the self-checkout systems currently available, performed a financial analysis focusing on the costs and benefits of self-checkout systems and on their payback periods, analyzed the sensitivity of the payback periods to changes in labor rates and hardware acquisition costs, and assessed the risks associated with implementing self-checkout systems in commissaries.

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